proj: **XENON TPC**
Xenon Pressure Chamber
title: **Pressure Safety Note**

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1. Introduction

This Safety Note covers a pressure vessel and associated inert gas system for a physics research experiment involving neutrinoless double beta decay, using Xenon gas. The heart of the system is a pressure vessel recently acquired by LBNL from LLNL. There are new components both purchased, and LBNL designed (in accordance with ASME Boiler and Pressure Vessel Code Section VIII, Div. 1, 2007), which will be attached to this pressure vessel, which are treated in this note. This Safety Note is to assure that the Experiment meets LBNL Pressure Safety requirements of PUB-3000. Under PUB3000, sec 7.6.1, it is classified as a High Hazard Pressure System, since there are gas pressures above 150 psig. An AHD is not required for the Xenon or Argon gases, nor any of the other materials inside, but there may be pressure and process hazards, so an AHD will be formulated.

The pressure vessel will enclose a small detector called a Time Projection Chamber (TPC) with Xenon gas used as both the electron drift volume and for electrical insulation. The vessel was designed by LLNL, and used at LLNL from 2000-2009 for a similar purpose, and has not been modified from the original design. LLNL Mechanical Engineering Safety Note MESN99-020-OA (1999) contains the vessel design calculations, performed in accordance with ASME Boiler and Pressure Vessel Code Section VIII (1995), and is included here in the Appendix. It includes pressure testing procedures. Also included is a copy of the original pressure test at LLNL for the vessel and head. The attached components consist of a 2" diameter high vacuum/high pressure valve, a Kimball physics octagonal vacuum chamber, a spool connecting the octagon to the vessel lid, assorted cabling feedthroughs, and a gas handling system composed of small diameter high pressure metal tubing, purifiers, valves, and pumps. The gas system includes a cryogenic Xenon reclamation cylinder, which was designed, built, and tested by Acme Cryogenics for LLNL, for 3000 psi MOP. We will be using it here at LBNL up to a pressure of 950 psi MOP. Its design calculations and test report are also included in the Appendix (LLNL M.E. Safety Note MESN99-038-OA). The pressure vessel is shown below: